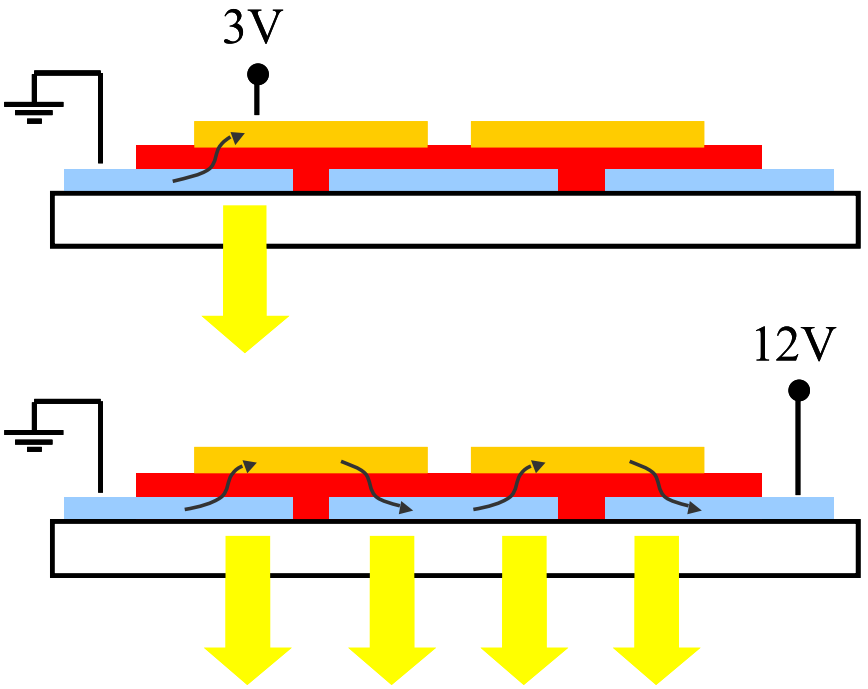
Charge Injection in Organics

George Malliaras, Cornell University, DMR-0094047

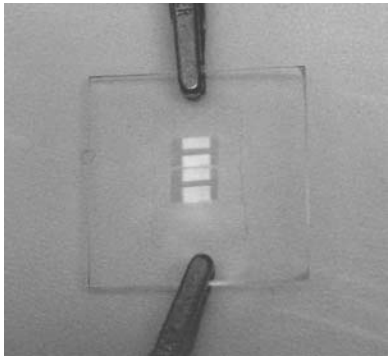
• This project has a dual objective: (a) to understand the fundamentals of charge injection in organic semiconductors, and (b) to use this knowledge in order to achieve organic semiconductor devices with improved performance.

• We recently found that ionic transition metal complexes, such as ruthenium tris-bipyridine, form ohmic contacts with practically any metal electrode. The reason for this is the presence of mobile ions, that accumulate near the electrodes and assist injection of electronic carriers. As a result, the same metal can be used *both* as an anode and as a cathode.

• We have taken advantage of this fact to demonstrate a new architecture for the fabrication of large area illumination panels. Such panels exhibit passive fault tolerance: They continue to operate at high brightness even when individual pixels are short-circuited.



Top: Architecture for large-area fault-tolerant panels.The panel continues to operate at a high brightness even when individual pixels are shorted. **Left:** Demonstration of a panel with four pixels.



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Education:

This work involves the training of two graduate students (Dan Bernards, Jason Slinker) and three undergraduate students (Sara Parker, Jonathan Rivnay, and Man Hoi Wong). This past summer, our research group hosted two undergraduate students (Sarah Cowan from CalPoly, and Jared Delcamp from Kentucky) as part of an REU program.

Outreach:

Malliaras helped run the CURIE Academy, a one-week residential program for high school girls who excel in math and science. It offers classes, labs, and research experiences designed and taught by Cornell's faculty and graduate students. This years project was on the operation of a CD player. Social events, panel discussions, and informal networking allows students to experience life on a university campus, and to make new friends from all over the country. The CURIE Academy seeks to advance diversity in engineering and encourages minorities to apply.

The PI supervises CURIE academy students who take apart CD players.